WHAT IS CLAIMED IS:

1. An impulse radio transmitter, comprising:

a time base to output a periodic timing signal;

a subcarrier modulator to receive a subcarrier signal and an information signal and modulate said subcarrier signal using said information signal and output a modulated subcarrier signal; and

an output stage to generate an impulse radio signal based on said periodic timing signal and said modulated subcarrier signal, wherein said impulse radio signal comprises pulses spaced in time.

2. The impulse radio transmitter of claim 1, further comprising:

a code source that uses said periodic timing signal to output a code signal, wherein said output stage generates said impulse radio signal based on said code signal and said modulated subcarrier signal.

3. An impulse radio transmitter, comprising:

a time base to output a periodic timing signal;

an encoder to receive a digital data signal and output a encoded digital data signal; and

an output stage to generate an impulse radio signal based on said periodic timing signal and said encoded digital data signal, wherein said impulse radio signal comprises pulses spaced in time.

4. The impulse radio transmitter of claim 3, wherein said encoder comprises a return-to-zero encoder.

5. The impulse radio transmitter of claim 3, wherein said encoder comprises one of a pseudo Manchester encoder, a frequency shift keying encoder, an n-ary phase modulation encoder and a phase amplitude modulation encoder.

6. The impulse radio transmitter of claim 3, further comprising:

a code source that uses said periodic timing signal to output a code signal, wherein said output stage generates said impulse radio signal based on said code signal and said encoded digital data signal.

7. A system for direct digitally encoding a data signal for impulse radio communications, comprising:

an impulse radio transmitter having an encoder that direct digitally encodes the data signal to produce a direct digitally encoded data signal; and

an impulse radio receiver having a decoder and a phase-locked loop, wherein said direct digitally encoding avoids errors in the phase-locked loop.

8. The system of claim 7, wherein said encoder comprises a return-to-zero encoder.

9. The system of claim 7, wherein said encoder comprises one of a pseudo Manchester encoder, a frequency shift keying encoder, an n-ary phase modulation encoder and a phase amplitude modulation encoder.

10. An impulse radio receiver, comprising:

a cross correlator to cross correlate a received impulse radio signal with a decode signal to output a baseband signal;

a lowpass filter that uses the baseband signal to output an error signal;

an adjustable time base, responsive to the error signal, to control lock of the cross correlation; and

a subcarrier demodulator, responsive to the baseband signal, to output a demodulated information signal.

11. The impulse radio receiver according to claim 10, wherein the subcarrier demodulator is a direct digital demodulator.

12. The impulse radio receiver according to claim 11, wherein the direct digital demodulator comprises a pseudo Manchester decoder.

13. A method for generating an impulse radio signal, comprising:

producing a periodic timing signal;

modulating a subcarrier signal using an information signal to output a modulated subcarrier signal; and

generating the impulse radio signal based on the periodic timing signal and the modulated subcarrier signal, wherein the impulse radio signal comprises pulses spaced in time.

14. The method of claim 13, further comprising:

producing a code signal based on the periodic timing signal; and

generating the impulse radio signal based on the code signal and the modulated subcarrier signal.

15. A method for generating an impulse radio signal, comprising:

producing a periodic timing signal;

encoding a digital data signal to output an encoded digital data signal; and

generating an impulse radio signal based on the periodic timing signal and the encoded digital data signal, wherein the impulse radio signal comprises pulses spaced in time.

16. The method of claim 15, wherein said encoding comprises return-to-zero encoding.

17. The method of claim 5, wherein said encoding comprises one of pseudo Manchester encoding, frequency shift keying encoding, n-ary phase modulation encoding and phase amplitude modulation encoding.

18. The method of claim 5, further comprising:

producing a code signal based on the periodic timing signal; and

generating the impulse radio signal based on the code signal and the encoded digital data signal.

19. A method for receiving impulse radio signals, comprising:

cross correlating a received impulse radio signal with a decode signal to output a baseband signal;

demodulating the baseband signal to output a subcarrier signal; and

demodulating the subcarrier signal to output an information signal.

20. The method according to claim 19, wherein said demodulating the baseband signal step comprises direct digitally demodulating the baseband signal to output the subcarrier signal.

21. The method according to claim 20, wherein said step of direct digitally demodulating further comprises pseudo Manchester decoding.

22. The method according to claim 19, further comprising:

lowpass filtering the baseband signal to output an error signal; and

adjusting a periodic timing signal using the error signal to time position the decode signal in relation to the position of the received impulse radio signal thereby optimizing the cross correlation.